




UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

OFFICE OF  
SOLID WASTE AND  
EMERGENCY RESPONSE

November 1, 2012

**MEMORANDUM**

**SUBJECT:** National Remedy Review Board and Contaminated Sediments Technical Advisory Group  
Recommendations for the Lower Duwamish Waterway Superfund Site

**FROM:** Amy R. Legare, Chair   
National Remedy Review Board

Stephen J. Ells, Chair   
Contaminated Sediments Technical Advisory Group

**TO:** Richard Albright, Director  
Office of Environmental Cleanup  
U.S. EPA Region 10

**Purpose**

The National Remedy Review Board (the Board) and the Contaminated Sediments Technical Advisory Group (CSTAG) have completed their review of the proposed cleanup action for the Lower Duwamish Waterway Superfund site, in Seattle, WA. This memorandum documents the Board's and CSTAG's advisory recommendations.

**Context for Board Review**

The Administrator established the Board as one of the October 1995 Superfund Administrative Reforms to help control response costs and promote consistent and cost-effective remedy decisions. The Board furthers these goals by providing a cross-regional, management-level, "real time" review of high cost proposed response actions prior to their being issued for public comment. The Board reviews all proposed cleanup actions that exceed its cost-based review criteria.

The Board review is intended to help control remedy costs and to promote both consistent and cost-effective decisions. Consistent with CERCLA and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), in addition to being protective, all remedies are to be cost-effective. The Board considers the nature of the site; risks posed by the site; regional, state, tribal and potentially responsible party (PRP) opinions on proposed actions; the quality and reasonableness of the cost estimates; and any other relevant factors or program guidance in making our advisory recommendations.

The overall goal of the review is to ensure sound decision making consistent with current law, regulations, and guidance.

Generally, the Board makes the advisory recommendations to the appropriate regional division director. Then, the region will include these recommendations in the administrative record for the site, typically before it issues the proposed cleanup plan for public comment. While the region is expected to give the Board's recommendations substantial weight, other important factors, such as subsequent public comment or technical analyses of response options, may influence the region's final remedy decision. The Board expects the regional division director to respond in writing to its recommendations within a reasonable period of time, noting in particular how the recommendations influenced the proposed cleanup decision, including any effect on the estimated cost of the action. Although the Board's recommendations are to be given substantial weight, the Board does not change the Agency's current delegations or alter the public's role in site decisions; the region has the final decision-making authority.

Office of Solid Waste and Emergency Response (OSWER) Directive 9285.6-08, February 2002, *Principles for Managing Contaminated Sediment Risks at Hazardous Waste Sites*, established the CSTAG as a technical advisory group to "...monitor the progress of and provide advice regarding a small number of large, complex, or controversial contaminated sediment Superfund sites...." One main purpose of the CSTAG is to guide Regional site project managers on how to appropriately manage their sites throughout the cleanup process in accordance with the 11 risk management principles set forth in the OSWER Directive. EPA decided not to have a separate technical review by the CSTAG per OSWER Directive No. 9285.6-20, September 2009, *Changes to the Roles and Responsibilities of the Contaminated Sediments Technical Advisory Group (CSTAG)*, but instead elected to have a combined NRRB/CSTAG meeting for this site. This joint meeting format is the approach EPA plans to take in the future at CSTAG sites.

### **Overview of the Proposed Action**

The preliminary preferred remedy presented by EPA Region 10 to the NRRB and CSTAG includes dredging 57 acres, partially dredging and capping 23 acres, capping 53 acres, and enhanced natural recovery (ENR), with potential addition of *in-situ* treatment, over 53 acres. Approximately 750,000 cubic yards of contaminated sediment would be dredged and disposed in an upland landfill. Monitored natural recovery (MNR) would be used to further reduce contaminant concentrations to the lowest technically achievable concentrations. Areas, volumes and costs are subject to change as the draft Feasibility Study is finalized. They will also be modified in the design phase based on additional sampling and verification of the natural recovery model. The preliminary preferred remedy will be conducted in coordination with an extensive source control program led by the Washington State Department of Ecology. The remedy includes institutional controls to further reduce exposures and long-term monitoring. The estimated construction timeframe is 7 years and cost is \$290 million. Region 10 is considering some modifications to the remedy including more intensive monitoring in unremediated areas, a requirement to dredge areas with high concentrations of contaminants in the shallow subsurface, and enhancements to institutional controls to address concerns raised by the community and affected Tribes.

### **National Remedy Review Board and Contaminated Sediments Technical Advisory Group Advisory Recommendations**



The Board and CSTAG (hereafter referred to as the boards) reviewed the information package describing this proposal and discussed related issues with Region 10 management and staff (Allison Hiltner, Bruce Duncan, Tim Brincefield, Renee Dagseth, Kris Flint, Erika Hoffman and Charlie Ordine); representatives from Washington State Department of Ecology; and Suquamish and Muckleshoot tribes on December 6, 2011. Based on this review and discussion, the boards offer the following comments:

### **Site Characterization**

In light of the presentations, the boards recommend the Region consider collecting the following information prior to implementation of the preferred alternative: 1) additional toxicity testing to refine the cleanup area footprint; and 2) baseline monitoring data for fish, shellfish and the water column over multiple years. These monitoring data can be used to evaluate the effectiveness of any implemented remedial actions.

### **Remedial Action Objectives and Cleanup Levels**

Explain RAOs more clearly - Based on the package submitted by the Region, it appears that the overall result of implementing the Region's preferred alternative should be a significant net reduction in sediment contamination and fish tissue PCB levels, and a net increase in allowable fish consumption compared to current conditions. At the same time, it appears that the Region's preferred alternative may not achieve fish tissue concentration levels that ensure protectiveness of human health without the addition of institutional controls (ICs) and also may not meet State standards (potential applicable or relevant and appropriate requirements [ARARs]). In addition, the Region acknowledged that recontamination (anthropogenic) from incoming Green River water and sediments is likely to raise contamination levels after cleanup of the site's sediment. The boards recommend that the decision documents clearly explain how the remedial action would achieve the Region's remedial action objectives (RAOs) and how ICs to limit fish consumption can help ensure protectiveness of human health in the long term.

Scope of the CERCLA cleanup - Based on the package and presentation to the boards, it is not clear whether or how the Region's preferred alternative would address potential contamination from groundwater, surface water and upland/upstream sources. For example, the information provided to the boards was unclear regarding the connection between the contaminants of concern (COCs) in sediment, pore water and surface water. Furthermore, while RAO #1 mentions surface water, the package and presentation did not include any thoroughly analyzed alternatives specifically focused on reducing surface water contamination or discussion of related ARARs compliance. The boards recommend that the Region clearly explain in its decision documents what this particular remedial action is intended to accomplish using CERCLA authority, what is being addressed by other parties under separate authority (e.g., how the State intends to use its own authority to control anthropogenic upland/upstream sources working as EPA's partner at this site) and what might be addressed in possible future CERCLA remedial actions.

Use of State standards - Based on the package and presentations made to the boards by the Region, State, and tribes, the cleanup levels for most alternatives and the criteria used to delineate the extent of "area of potential concern #1" (AOPC #1) were based on the State's ecologically-based sediment quality standards (SQSSs) and cleanup screening level (CSLs). The boards note that a key goal of RAO #1 is the protection of human health from the ingestion of fish and shellfish contaminated with



polychlorinated biphenyls (PCBs). In addition, the boards note that the SQS for PCBs (240 parts per billion [ppb]) and the CSL for PCBs (1300 ppb [using a total organic carbon of 2 percent]) are also the preliminary remediation goals (PRGs) for RAO#3 (protection of ecological receptors). The boards recommend that the Region clearly explain the use of the SQSs and CSLs in its decision documents with regard to developing RAOs #1 and #3; the Region also should explain why it used 240 ppb as the PRG for RAO#3 when site-specific toxicity tests in some cases showed no toxicity at this concentration.

In addition, the package and presentation to the boards indicated that the Region's preferred cleanup alternative (5C) would select a cleanup level for sediments exceeding 240 ppb for PCBs (even though the ultimate cleanup goal to protect human health based on MTCA would be 2 ppb). The boards recommend that the Region's decision documents clearly explain the basis for selecting 240 ppb as a trigger for action, for determining health-based cleanup levels and for delineating the areas that need to be actively remediated.

Fish tissue levels for monitoring - The boards recommend that in order to evaluate the effectiveness of the cleanup in ensuring protectiveness of human health, the Region consider development of a risk-based tissue concentration for specific fish and shellfish reflecting realistic consumption scenarios. This fish tissue concentration could be used to monitor progress in achievement of RAO #1 by providing a metric for what the Region believes is a protective risk-based consumption level. For example, the decision documents could state that: *"To ensure protectiveness of human health at this site, a tissue level of x.xx ppb PCBs in fish fillet will be used to evaluate whether the cleanup achieves an acceptable cancer risk based on the adult tribal RME resident seafood consumption rate of 97.5 g/day."* Furthermore, the boards recommend that the Region consider developing interim target concentrations in fish tissue for specific scenarios (e.g., central tendency, other meal consumption rates, etc.) for inclusion in its decision documents as interim monitoring measures designed to provide data for cleanup progress evaluation (e.g., metrics to be used for gauging remedy effectiveness and movement toward attainment of the RAOs/remedial goals). Such monitoring targets, once they are reached, could be used to evaluate whether future relaxation or modification of the fish consumption advisories and fishing restrictions would be appropriate (e.g., changing the "eat none" advisory for Lower Duwamish Waterway [LDW] resident fish and shellfish as conditions improve).

## **Remedy Performance**

Interim remedy approach -The preferred alternative advocated by the Region represents a comprehensive approach to improve the environmental quality of the LDW. The effectiveness of the ongoing source control efforts by the State at this site is uncertain at this time. Current natural recovery model predictions indicate that final PCB sediment levels will be in the order of 40 ppb (based on the influx of sediments from the Green/Duwamish River), substantially higher than the PRG of 2 ppb. The higher level (40 ppb) reflects the anticipated upstream (anthropogenic) conditions. The PRG of 2 ppb is derived from a 2008 EPA study and is the natural background concentration required to be met under the Washington Model Toxics Control Act (MTCA) (a potential ARAR). However, as explained by the Region, under MTCA, if the human health risk-based threshold concentration is less than natural background, then the default is to natural background, in this case 2 ppb. Based on the information provided to the boards, the PRG does not at this time appear to be achievable even if sources are addressed. The Region should acknowledge in the remedy decision document that: 1) sources need to be addressed, and 2) the goal of achieving 2 ppb will be addressed at an appropriate point of time in the



future based on data following this remedial action. As such, the boards recommend that the Region consider selecting a cleanup as an interim remedy.

Phased approach - The boards recommend that the Region consider an iterative and phased approach to allow for effectiveness monitoring, which would provide more information and better certainty to support subsequent cleanup actions. This approach likely would include both: 1) ICs to restrict fish consumption and 2) monitoring to evaluate the rate of natural recovery as well as other data gathering to help evaluate State and related planned early action areas' (EEAs') ongoing and future source control effectiveness.

As part of a phased approach, the boards recommend that the Region consider using 2 – 5 years of monitoring data to evaluate the results of the EAAs and help determine the scope of any additional remedial action beyond that selected in the ROD.

MNR - Based on the information presented to the boards, it appears appropriate to consider and evaluate MNR at this site based on model estimates. These estimates indicate the potential for significant risk reduction due to implementation of early actions and MNR in ten years due to the relatively high level of sediment deposition in many areas of the waterway; however, the boards recognize that the site modeling conducted for the LDW has significant uncertainties. The boards believe that considering an MNR and IC-only alternative can provide useful information when evaluating and describing the EEAs' contributions and potential advantages. Consistent with the NCP, the decision document should contain the nine criteria evaluation of all alternatives, including the MNR and IC-only alternative. The boards note that per OSWER Directive No. 9355.0-85, December 2005, *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites*, MNR should not be confused with a "no-action" alternative.

Modelling - The boards recognize there is significant uncertainty in the natural recovery and food web models predictions. The boards recommend the Region better explain the models' uncertainties and how the preferred alternative would achieve risk reduction, ensure protectiveness of human health and the environment, be cost-effective as well as consistent with CERCLA and the NCP (including the requirements of CERCLA section 121).

Enhanced Natural Recovery (ENR) - Based on the information presented to the boards, the Region's preferred alternative would use 240 ppb (point concentration for active remediation) for PCBs as the cleanup level for concentrations in the surface sediment and 2 ppb (average concentration in waterway sediments after natural recovery) as the PRG. The Region also indicated that, as part of its preferred remedy in dredged areas with a water depth greater than 10 feet, no backfill would be added once 240 ppb is reached. Although natural recovery is projected by the models to occur in these areas, the boards recommend that the Region consider adding an appropriate layer of backfill in these areas to accelerate the natural recovery process. In addition, for areas shallower than 10 feet that will be capped and backfilled, the boards recommend that the Region consider using a design of a minimal (as small as possible) armored layer (if needed for erosion protection) with an appropriate habitat layer for purposes of protecting the environment.

Dredging - For alternatives that include dredging of areas exceeding the cleanup level, it was unclear in the information presented to the boards how the Region would determine the depth at which dredging would stop. Some of the information seemed to indicate that full removal of the contamination would



occur (to a maximum depth of four feet), but during the meeting, the Region seemed to indicate that dredging would occur only to the depth necessary to meet the cleanup level (e.g., 240 ppb for PCBs) and that material with concentrations lower than the cleanup level but exceeding the PRG (2 ppb) would be left in place. It was unclear whether confirmation sampling would be conducted during dredging or whether dredging would be conducted to specified cut-lines based on pre-design data. The boards recommend that the Region clearly explain how it intends to address these issues in its decision documents.

Background - Based on the package and presentation to the boards, the Green River and upland sources will continue to recontaminate the LDW surface sediments for the foreseeable future. Although the State has a program in place that is designed to address these sources eventually, PCBs and other COCs may not be controlled for many years. The boards recommend that the Region's decision documents explain how the preferred remedy is consistent with existing Agency guidance on the role of background and how final cleanup levels will be set in light of background contamination (e.g., OSWER Directive 9285.6-07P, *Role of Background in the CERCLA Cleanup Program*, April 2002), as well as OSWER Directive No. 9285.6-08, February 2002, *Principles for Managing Contaminated Sediment Risks at Hazardous Waste Sites*. Furthermore, the Region should explain the concrete steps and accomplishments that have occurred (e.g., with regard to the LDW upstream inputs and the watershed's combined sewer overflows) since CSTAG's December 2003 recommendations for this site.

Technology - Based on the presentation (and pre-meeting discussion), the Region is considering using a form of *in-situ* treatment technology for lowering the bioavailability of PCBs, such as the addition of activated carbon amendments to the sediments, and possibly to address arsenic as well in the 53 acres selected for ENR. The Region noted that the prediction model did not use any activated carbon partitioning data to indicate the potential for less time to meet the remediation goals. The boards support the Region's plans to collaborate with the experts in this evolving field and to conduct further studies (such as batch, column, and pilot-scale) of this technology to better understand physical stability and its effect on reducing bioavailability to biota (clams, fish etc.). A pilot study could provide information on reductions in bioavailability associated with reduced contaminant accumulation by fish and shellfish and the extent to which an *in-situ* technology could thereby further reduce risks to human and ecological consumers of fish and shellfish. The boards recommend that the Region consider developing a new RAO if a technology proves practical, for example: "*Reduce the degree of bioavailability and resulting exposure of PCBs and other organic risk-driving contaminants to levels protective human health and the environment.*"

Subsurface - Based on the presentation to the boards, the Region had not yet delineated which areas containing subsurface contamination above 240 ppb should be dredged as part of its preferred alternative, given that the surface concentrations did not exceed this level. The boards recommend that the Region's decision documents explain which site areas would be identified for remediation based on subsurface concentrations above cleanup levels. The decision documents should also explain how the Region would evaluate whether there is a reasonable probability that subsurface contamination poses a risk warranting CERCLA response action to address a potential exposure pathway threat. A large increase in the volume of material to be dredged could change many factors in the detailed analysis provided to the boards and could affect the selection of a preferred alternative.

Short-term effectiveness - The package provided to the boards included information on an environmental justice (EJ) assessment performed to evaluate the disproportionate impacts to EJ



communities associated with the proposed remedy. One measure to offset the potential for short-term increased health risks during construction can be fish trading. The boards recommend further evaluation of a fish trading program in light of potential implementation difficulties and drawbacks (e.g., evaluate commercial fish to ensure that the fish trade program would reduce PCB exposure). The boards recommend that the Region consider appropriate ways to ensure that any such program not be conducted indefinitely and evaluate potential specific plans as to how/when to end the program. In addition the boards note that short-term effectiveness is one of the NCP's nine criteria that can be used to evaluate how an alternative affects human health and the environment during the construction phase of the remedial action and during the length of time until risk reduction objectives are met. As provided in the NCP, this criterion includes consideration of "short-term risks that might be posed to the community during implementation of the remedy;" as such, the boards recommend that the Region carefully consider how implementation of any dredging components of the remedy might result in short-term elevations of fish tissue concentrations of site-related contaminants, and evaluate whether populations continuing to consume LDW fish may be at an increased risk of acute health effects as a result of these activities. The boards recommend that the Region address these issues when discussing short-term effectiveness in its decision documents.

Based on the information presented to the boards, the Region estimates that it will take 10 years to complete the planned early actions and the proposed remedy. This timeframe is due in part to the fact that dredging would be limited to about three to four months each year in an effort to protect threatened juvenile salmon leaving the river. Remediation times may also be affected by tribal fishing during salmon runs. Also, there would be elevated PCB levels in tissue of resident fish/crabs during and for a period following dredging. Since the current risks are high due to the known ongoing consumption of fish despite fish advisories already in place, the boards are concerned that the length of the cleanup could significantly increase the current fish consumption risk. The boards recommend that this issue be thoroughly discussed in the evaluation of short-term effectiveness. The boards also recommend that the Region evaluate, and discuss with stakeholders (particularly the tribes, National Marine Fisheries Service, U.S. Fish and Wildlife Service, and the State), the option of opening most or all of the rest of the year for dredging to decrease the time of the cleanup and, therefore, the time that the resident fish have an increased level of PCBs. Additionally, the boards recommend that the Region estimate the interim PCB levels in the fish and the associated increase in risk to human health during and for some period after the cleanup. This estimate could be used to help compare short-term effectiveness between the various alternatives and to compare with monitoring data during the cleanup.

### **Applicable or Relevant and Appropriate Requirements**

During its presentation to the boards, the Region presented its position regarding potential state ARARs (e.g., MTCA, sediment management standards, etc.) that should be identified as such in the decision documents. To the extent the State standards are potential ARARs, the Region believes some of them may need to be waived. The boards recommend that the administrative record contain sufficient information to support an ARAR waiver, should one become necessary in the future after additional cleanup work and data collection takes place.

### **Cost**

The package provided to the boards states that the net-present value costs were calculated using a 2.3 percent discount rate instead of 7 percent per OSWER Directive No. 9355.0-75, *A Guide to Developing*

and Documenting Cost Estimates During the Feasibility Study, July 2000. The package further states that the rationale for using a lower discount rate is included in the Feasibility Study. The boards recommend that the Region include this information in the decision documents along with costs calculated using both discount rates in order to create parity across all EPA regions.

## Conclusion

We commend the Region's collaborative efforts in working with the Board, CSTAG and stakeholder groups at this site. We request that a draft response to these recommendations be included with the draft proposed plan when it is forwarded to the Office of Superfund Remediation and Technology Innovation's Site Assessment and Remedy Decisions (SARD) branch for review. The SARD branch will work with both your staff and the Board to resolve any remaining issues prior to your release of the record of decision. This memo will be posted to the Board's website (<http://www.epa.gov/superfund/programs/nrrb>) and CSTAG's website (<http://www.epa.gov/superfund/health/conmedia/sediment/cstag.htm>) within 30 calendar days of our signatures. Once your response is final and made part of the site's administrative record your response will also be posted on the boards' websites.

Thank you for your support and the support of your managers and staff in preparing for this review. Please call me at (703) 347-0124 or Steve Ells at (703) 603-8822 should you have any questions.

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